

Miguel Costas

Curriculum Vitae, updated April 14, 2021

Trondheim, Norway
☎ (+47) 469 67 251
(+34) 660 784 672
✉ miguel.costas@ntnu.no
Birth date: 11.28.1987



Education

- 2011–2016 **PhD. in Civil Engineering, area of Continuum Mechanics and Structural Theory**, *School of Civil Engineering*, University of A Coruña.
Doctoral thesis: *Crashworthiness analysis and design optimization of hybrid impact energy absorbers* Research stay at SIMLab (NTNU) during six months, granted by Fundación Barrié.
- 2005–2010 **MEng. in Civil Engineering (Ingeniero de Caminos, Canales y Puertos)**, *School of Civil Engineering*, University of A Coruña.
Number 11 of 95 in class. Erasmus exchange program at Syddansk Universitet (Odense, Denmark).
- 2005 **Professional degree in Music**, *Conservatory of Santiago de Compostela*.
Specialization in piano and musical analysis.

Awards

- 2016 **Extraordinary PhD. award**, *University of A Coruña*.
Yearly award to the best PhD. thesis in the field of Engineering at the University of A Coruña.
- 2016 **International PhD. mention**, *University of A Coruña*.
Awarded to PhD. projects which include a successful international collaboration and a research stay.
- 2016 **Cum laude PhD.**, *University of A Coruña*.
Awarded to PhD. theses with outstanding contributions, agreed by the committee by secret individual votes.

Work history

- 2019–Present **Researcher**, *Centre for Advanced Structural Analysis (CASA)*, NTNU (Trondheim, Norway).
- 2017–2019 **Postdoctoral researcher**, *Centre for Advanced Structural Analysis (CASA)*, NTNU (Trondheim, Norway).
- 2016 **Postdoctoral researcher**, *Structural Mechanics group*, University of A Coruña.
- 2011–2015 **RD engineer and PhD candidate**, *Structural Mechanics group*, University of A Coruña.
- Summer 2009 **Internship**, *Port Authority of Vilagarcía de Arousa (Puertos del Estado)*.

Teaching experience

- 2019–Present **Teacher and coordinator of “Materials Mechanics” (TKT4135)**, master programmes, NTNU.
- 2015–2018 **Teacher of “Advanced structural analysis” in the Master in Structural and Material Aerospace Engineering**, *School of Civil Engineering*, UDC.
- 2013–2014 **Assistant in the practical training of the subject “Bridges 1”**, *School of Civil Engineering*, UDC.

Supervision of PhD. theses

- 2019–2023 **“Behaviour and modelling of multi-layered joints”**, PhD. candidate Victor André, NTNU.

Languages

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| Spanish | Native | |
| Galician | Native | |
| English | Full professional proficiency | Certificate in Advanced English, Cambridge University. 2012. |
| Norwegian | Intermediate professional proficiency, level B2 | |
| French | Basic professional proficiency, level B1 | |
| Portuguese | Basic professional proficiency | |

Computation skills

FEM	Abaqus Standard and Explicit including user material subroutines, LS-DYNA, Ansys, SAP2000, Cosmos/M.
Optimization	Experience in structural optimization: DAKOTA and LS-OPT.
CAD	Autocad, Solidworks.
Programming	Python, Fortran, Bash, L ^A T _E X.

Projects and activities in collaboration with industry

UDC Collaborations from 2011 to 2016:

- [**Airbus**, European project] FP7-AAT-2007-RTD-1. MAAXIMUS: More affordable Aircraft Structure through Extended, Integrated and Mature Numerical Sizing, UE, 03/2008-03/2013. Years 2011-2015. Budget: 370000 €.
- [**Acciona Energy**, national Spanish project] UNCL13-1E-2123. Boundary layer wind tunnel for civil and aeronautical engineering applications. Spanish Ministry of Economy and Competitiveness. Year 2014. Budget: 325000 €.
- [**Acciona Construction**, national Spanish project] DURAPORT. New technologies for the construction of durable port infrastructure. CDTI, program FEDER-INTERCONNECTA, Spanish Ministry of Economy and Competitiveness, ref. 407. Years 2011-2012. Budget: 40000 €.
- [**CTAG**, regional Galician project] 09DPI-011118PR INCITE 2009. Optimum design of automobile structures and components with metallic and composite materials. Regional Counseling of Economy and Industry. Years 2009-2012. Budget: 45000 €.
- [**CTAG**, regional Galician project] 10DPI025CT. Hybrid-Body: structural optimization of a hybrid sistem for frontal impact energy absorption with experimental and numerical validation. Regional Counseling of Economy and Industry. Years 2010-2012. Budget: 46000 €.
- [**Puentes y calzadas**] Seismic design in linear and nonlinear regimes of the new bridge over the river Chiche, in Ecuador. Ref. 443. Year 2013. Budget: 44504.77 €.
- [**Airbus**] Optimization study of rear fuselage. Year 2015. Budget: 25561.26 €.
- [**Airbus**] Junction modeling of nonlinear frequency response of assembled structures. Extension of 2012 activities. Year 2015. Budget: 24200 €.

NTNU Collaborations from 2017 to present:

- [**Hydro Extruded Solutions**] Study of fibrous and recrystallised AA6005-T6 for the development of a through-thickness ductile damage regularisation model for shells. Years 2017-2018.
- [**Toyota Motor Europe**] Effect of pilot holes on the mechanical behaviour of flow-drill screw joints. Years 2017-2019.
- [**Renault**] Flow drill screw joints combining steel and cast aluminium. Years 2018-2019.
- [**Toyota Motor Europe**] Study of hybrid joints with adhesive and flow drill screws. Years 2018-2020.
- [**Hydro Extruded Solutions**] Study of friction stir welds in AA6082-T6 extruded aluminium panels. Years 2019-2020.
- [**Toyota Motor Europe**] Study of the extrusion length produced during the assembly of flow-drill screws. Years 2019-2020.
- [**Hydro Extruded Solutions**] Study of a new high-strength aluminium alloy and development and implementation of an anisotropic through-thickness ductile damage regularisation model for shells. Years 2019-2020.
- [**MX3D and Multiconsult**] Study of the material and structural properties of square hollow beams fabricated by wire arc additive manufacturing. Years 2020-2021.
- [**Hydro Extruded Solutions, Toyota Motor Europe, Audi, BMW, Honda, Airbus, Renault**] Calibrations, workshops, seminars and stays related to the industrial implementation of the through-thickness damage regularisation model.

Patents in collaboration with industry

- National Spanish patent no. ES 2-386-269-B1: Hybrid metal-composite system for crash energy absorption. Authors: Alberto Tielas, Isabel Álvarez, Raquel Ledo (Centro Tecnológico da Automoción de Galicia, CTAG); Miguel Costas, Luis Esteban Romera (University of A Coruña, UDC). Granted on the 11th of July 2013.

Other RD projects

- [National project] DPI 2013-41893-R. OPTOPAER. Probabilistic topologic and topometric optimization of aeronautical structures in linear and nonlinear regimes. Spanish Ministry of Economy and Competitiveness. Years 2014-2016. Budget: 53240 €.
- [Regional project] GRC2013-056. Group of Competitive Reference. Regional Counseling of Culture, Education and Universities. Years 2013-2016. Budget: 259000 €.

RD fundraising – awarded projects

- [National project] PID2019-108307RB-I00. OPTIFUSE. Reliability-based crashworthiness and damage tolerant optimization of new generation fuselage structures. Spanish Ministry of Science and Innovation. Year 2020. Budget: 154000 €+ PhD contract.
- [National project] DPI2016-76934-R. OPTISAFE. Probabilistic optimization of intact and damaged aeronautical structures under dynamic and impact loading. Spanish Ministry of Economy and Competitiveness. Year 2016. Budget: 111600 €.

Publications

Research articles in JCR journals.

M. Costas, M. Edwards-Mowforth, M. Kristoffersen, F. Teixeira-Dias, V. Brøtan, C.O. Paulsen, and T. Børvik. Ballistic impact resistance of additive manufactured high-strength maraging steel: an experimental study. *Journal of Materials Processing Technology*, 2021 [submitted to Materials and Design].

Miguel Costas, David Morin, Johan Kolstø Sønstabø, and Magnus Langseth. On the effect of pilot holes on the mechanical behaviour of flow-drill screw joints. experimental tests and mesoscale numerical simulations. *Journal of Materials Processing Technology*, 294:117133, 2021.

Håkon Johannessen, Oddvar Hestetraet Johannessen, Miguel Costas, Arild Holm Clausen, and Johan Kolstø Sønstabø. Experimental and numerical study of notched SHS made of different S355 steels. *Journal of Constructional Steel Research*, 182:106673, 2021.

J. Paz, M. Costas, J. Delgado, L. Romera, and J. Díaz. Energy absorption of aluminium extrusions filled with cellular materials under axial crushing: Study of the interaction effect. *Applied Sciences*, 10(23), 2020.

A. Muñoz-Ibáñez, J. Delgado-Martín, M. Costas, J. Rabuñal-Dopico, J. Alvarellos-Iglesias, and J. Canal-Vila. Pure Mode I Fracture Toughness Determination in Rocks Using a Pseudo-Compact Tension (pCT) Test Approach. *Rock Mechanics and Rock Engineering*, 53:3267–3285, 2020.

M. Kristoffersen, M. Costas, T. Koenis, V. Brøtan, C.O. Paulsen, and T. Børvik. On the ballistic perforation resistance of additive manufactured AlSi10Mg aluminium plates. *International Journal of Impact Engineering*, 137:103476, 2020.

M. Costas, D. Morin, M. de Lucio, and M. Langseth. Testing and simulation of additively manufactured AlSi10Mg components under quasi-static loading. *European Journal of Mechanics - A/Solids*, 81:103966, 2020.

M. Costas, D. Morin, O.S. Hopperstad, T. Børvik, and M. Langseth. Corrigendum to “A through-thickness damage regularisation scheme for shell elements subjected to severe bending and membrane deformations” [Journal of the Mechanics and Physics of Solids 123 (2019) 190–206]. *Journal of the Mechanics and Physics of Solids*, page 103794, 2019.

M. Costas, D. Morin, O.S. Hopperstad, T. Børvik, and M. Langseth. A through-thickness damage regularisation scheme for shell elements subjected to severe bending and membrane deformations. *Journal of the Mechanics and Physics of Solids*, 123:190 – 206, 2019.

M. Costas, D. Morin, M. Langseth, J. Díaz, and L. Romera. Static crushing of aluminium tubes filled with PET foam and a GFRP skeleton. Numerical modelling and multiobjective optimization. *International Journal of Mechanical Sciences*, 131-132:205 – 217, 2017.

M. Costas, D. Morin, M. Langseth, L. Romera, and J. Díaz. Axial crushing of aluminum extrusions filled with PET foam and GFRP. An experimental investigation. *Thin-Walled Structures*, 99:45–57, 2016.

J. Paz, J. Díaz, L. Romera, and M. Costas. Size and shape optimization of aluminum tubes with GFRP honeycomb reinforcements for crashworthy aircraft structures. *Composite Structures*, 133:499–507, 2015.

M. Cid Montoya, M. Costas, J. Díaz, L. E. Romera, and S. Hernández. A multi-objective reliability-based optimization of the crashworthiness of a metallic-GFRP impact absorber using hybrid approximations. *Structural and Multidisciplinary Optimization*, 52(4):827–843, 2015.

J. Paz, J. Díaz, L. Romera, and M. Costas. Crushing analysis and multi-objective crashworthiness optimization of GFRP honeycomb-filled energy absorption devices. *Finite Elements in Analysis and Design*, 91:30 – 39, 2014.

M. Costas, J. Díaz, L. Romera, and S. Hernández. A multi-objective surrogate-based optimization of the crashworthiness of a hybrid impact absorber. *International Journal of Mechanical Sciences*, 88:46–54, 2014.

M. Costas, J. Díaz, L. E. Romera, S. Hernández, and A. Tielas. Static and dynamic axial crushing analysis of car frontal impact hybrid absorbers. *International Journal of Impact Engineering*, 62:166–181, 2013.

Book chapters.

Jacobo Díaz and Miguel Costas. Crashworthiness. In Holm Altenbach and Andreas Öchsner, editors, *Encyclopedia of Continuum Mechanics*, Berlin, Heidelberg, 2019. Springer Berlin Heidelberg.

International conferences.

M. Costas, D. Morin, and M. Langseth. An experimental and numerical study on the lateral crushing of additively manufactured AlSi10Mg boxes. In *European Conference on the Structural Integrity of Additively Manufactured Materials, Trondheim (Norway)*, 2019.

M. Kristoffersen, M. Costas, C.O. Paulsen, T. Koenis, V. Brøtan, and T. Børvik. Experimental and numerical investigations of additively manufactured AlSi10Mg plates subjected to ballistic perforation. In *European Conference on the Structural Integrity of Additively Manufactured Materials, Trondheim (Norway)*, 2019.

M. Costas, D. Morin, and M. Langseth. Modelling and simulation of impact in stiffened aluminium panels using damage regularisation. In *ASIDIC2019, Aerospace Structural Impact Dynamics International Conference, Madrid (Spain)*, 2019.

M. Costas, D. Morin, and M. Langseth. Modelling of steel-aluminium components using structural adhesive and self-piercing rivets. In *12th European LS-DYNA Conference, Koblenz (Germany)*, 2019.

D. Morin, M. Reil, T. Berstad, M. Costas, and M. Langseth. Multi-scale numerical simulations of structural joints with flow-drill screws using a virtual material calibration. In *12th European LS-DYNA Conference, Koblenz (Germany)*, 2019.

D. Morin, T. Berstad, M. Costas, O.S. Hopperstad, and M. Langseth. *MAT_258: A through-thickness regularization scheme for shell element analyses – application to aluminium components. In *12th European LS-DYNA Conference, Koblenz (Germany)*, 2019.

J.K. Holmen, J. Johnsen, M. Costas, D. Morin, T. Berstad, T. Børvik, O.S. Hopperstad, and M. Langseth. Applications of *MAT_258: A through-thickness regularization model for shells. In *Dynamore Nordic Users' Conference 2018, Gothenburg (Sweden)*, 2018.

D. Morin, J.K. Holmen, J. Johnsen, M. Costas, T. Berstad, T. Børvik, O.S. Hopperstad, and M. Langseth. Theoretical aspects of *MAT_258: A through-thickness regularization model for shells. In *Dynamore Nordic Users' Conference 2018, Gothenburg (Sweden)*, 2018.

J. Díaz, L. E. Romera, M. Costas, and J. Paz. Reliability-based crashworthiness optimization of hybrid metal-composite energy absorption devices. In *ICCS19 - 19th International Conference on Composite Structures, Porto (Portugal)*, 2016.

L. Romera, L. Pire, M. Costas, J. Paz, J. Díaz, and S. Hernández. Improvement of crash forces in structures using optimization tools. In *HPSM/OPTI 2016, International Conference on High Performance and Optimum Design of Structures and Materials. Siena (Italy)*, 2016.

M. Costas, J. Díaz, L. E. Romera, D. Morin, and M. Langseth. Experimental characterization and numerical multi-objective optimization of the crashworthiness of aluminum extrusions filled with PET foam and GFRP. In *1st International Conference on Impact Loading of Structures and Materials (ICILSM), Turin (Italy)*, 2016.

J. Díaz, L. E. Romera, J. Paz, and M. Costas. Crashworthiness optimization of metal-composite energy absorption devices. In *ICCS18 - 18th International Conference on Composite Structures, Lisbon (Portugal)*, 2015.

L. Romera, M. Costas, J. Díaz, J. Paz, and S. Hernández. Reduction of the frontal crash peak forces in a car using size optimization tools. In *35th FISITA World Automotive Congress, Maastrich (Netherlands)*, 2014.

J. Díaz, M. Costas, L. Romera, J. Paz, and S. Hernández. Surrogate-based multi-objective optimization of glass-fiber - steel crash absorbers. In *35th FISITA World Automotive Congress, Maastrich (Netherlands)*, 2014.

L. Romera, S. Hernández, M. Costas, A. Balomir, and P. Ouro. Assessment of seismic behaviour of portal bridges with double friction pendulum bearings. In *7th IABSE Symposium, Madrid (Spain)*, 2014.

L. Romera, J. Paz, M. Costas, J. Díaz, and S. Hernández. Crashworthiness response of honeycomb metallic-GFRP energy absorption devices. In *HPSM/OPTI 2014, The 2014 International Conference on High Performance and Optimum Design of Structures and Materials*, 2014.

M. Costas, L. Romera, J. Díaz, S. Hernández, and A. Tielas. Computational and experimental analysis of a hybrid car impact absorber. In *Computational Methods and Experimental Measurements XVI*, WIT Press, C.A. Brebbia, G. M. Carlomagno and S. Hernandez (eds.), pages 367–378, 2013.

M. Costas, J. Díaz, L. Romera, S. Hernández, and R. Ledo. Influence of welded joints on the crashworthiness response of hybrid structural elements. In *SAE 2013 World Congress and Exhibition, paper 13B-0036/2013-01-0755*, 2013.

International research stays

- Research stay from 1/10/2014 to 1/4/2015 (six months) at the Structural Impact Laboratory (NTNU, Norway) supervised by Prof. Magnus Langseth and Dr. David Morin.

Scientific advisory

- Reviewer in JCR journals *Journal of the Mechanics and Physics of Solids*, *Engineering Fracture Mechanics*, *European Journal of Mechanics A/Solids*, *International Journal of Impact Engineering*, *International Journal of Mechanical Sciences*, *Materials and Design*, *Journal of Reinforced Plastics and Composites*, *Engineering Optimization*, *Computers and Structures*, *Composites Part B* and *Thin-Walled Structures*.
- External advisor, Group of Structural Mechanics, University of A Coruña.
- Opponent in PhD thesis committees at: The University of Edinburgh (2019).

Other information

- Driving license. Car owner.
- Piano teacher and active professional concert pianist.